



The Science Behind the BLS Guidelines

Part I: Adult

Part II: Infant and Child



Lecture

Objectives

At the end of this lecture, the instructor candidates will be able to

- Discuss the science supporting the new BLS Guidelines recommendations
- Discuss how these recommendations can be applied to CPR scenarios and practice
- Answer questions that may arise during CPR courses

International Guidelines Development Process

- **Recommendations were developed during 2 international conferences**
 - **Involved more than 500 experts from 30 countries**
 - **Experts reviewed over 25,000 manuscripts**
- **Recommendations then were reviewed and revised by international subcommittee and 2 editorial groups**
- **Final recommendations were endorsed by 6 international resuscitation councils**



The Science Behind the BLS Guidelines

Part I: Adult

Prearrest BLS Emergencies

Acute Coronary Syndromes

- **Acute Coronary Syndromes (ACS) develop when an artery in the heart is blocked and heart muscle does not receive enough oxygen**
- **ACS can cause chest pain or a heart attack and may cause *ventricular fibrillation* (the heart quivers and can't pump blood) with cardiac arrest**
- **New treatments can open the blocked artery, but are most effective if started within hours**

Acute Coronary Syndromes: Early Call to EMS Important

- **Most deaths occur in the first *hour* after symptoms start**
- **Many patients (eg, the elderly, women, diabetics, and those with known heart disease) have *vague* signs; some deny signs**
- **Phone 911 to be sure victim is delivered to the hospital by EMS personnel prepared to deal with emergencies**

Prearrest BLS Emergencies Acute Ischemic Stroke

- **A stroke results from a blocked artery in the brain or bleeding into the brain**
- **If the stroke is caused by a clot, “clot-busting” drugs can limit brain damage and improve recovery *if* given within 3 hours of the onset of stroke signs**
- **Stroke victims may not understand their symptoms or may deny them, delaying call to EMS and delaying treatment**

Acute Coronary Syndromes and Stroke: Lay Rescuer Actions

- **Recognize signs and symptoms**
- **Phone EMS (911)**
- **If patient becomes unresponsive, begin steps of CPR**
 - **Assess and support Airway, Breathing, and Circulation**
 - **Use AED if needed**
 - **If patient is breathing normally, place in recovery position**

The Recovery Position

- **Used for unresponsive victims with normal breathing and no signs of injury**
- **Helps maintain an open airway and reduces risk of aspiration**
- **Several versions are acceptable**
- **Rotate victim to opposite side after 30 minutes**

The Sequence of Actions for the Lone Rescuer

- ***“Phone first”*** for unresponsive adults
- ***“Phone fast”*** (CPR first) for unresponsive infants and children
- **Exceptions: *“Phone fast”* (provide CPR first) for *all* victims of**
 - Submersion/near-drowning
 - Injury
 - Drug overdose***“Phone first”* if any infant or child with heart disease collapses suddenly**

Rescue Breathing

- Provides oxygen and removes carbon dioxide
- Avoid rescue breathing that is too forceful or too rapid
- May cause gastric inflation (air in the stomach), with possible complications:
 - Resistance to effective rescue breaths
 - Vomiting
 - Aspiration of stomach contents
 - Pneumonia

Rescue Breathing: Without Supplementary Oxygen

Mouth-to-mouth or mouth-to-mask ventilation (without supplementary oxygen):

- Deliver breath until you see ***obvious chest rise***
- Deliver over 2 seconds

Rescue Breathing: With Supplementary Oxygen

Some mouth-to-mask devices can provide supplementary oxygen during rescue breathing. This will allow you to support the victim's oxygenation with smaller breaths:

- Deliver breaths until the chest ***begins to rise***
- Deliver over 1 to 2 seconds

Pulse Check not Recommended for Lay Rescuers

- **Pulse check requires too much time**
- **Rescuers are wrong about a pulse check 35% of the time**
- **Some victims of cardiac arrest are “missed” because rescuers think a pulse is present when it isn’t**
- **Lay rescuers should check for “signs of circulation” (normal breathing, coughing, or movement after 2 breaths)**

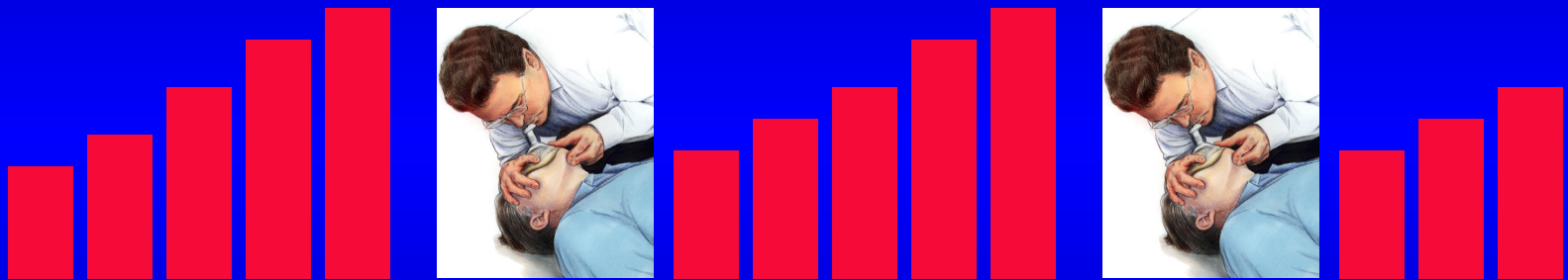
Adult Chest Compression Rate and Ratio

- When chest compression rates are above 80/min, blood flow to the heart muscle is improved during CPR
- Rescuers often compress at a slow rate of compressions
- A large series of uninterrupted compressions will increase the blood flow to the heart and improve survival from cardiac arrest

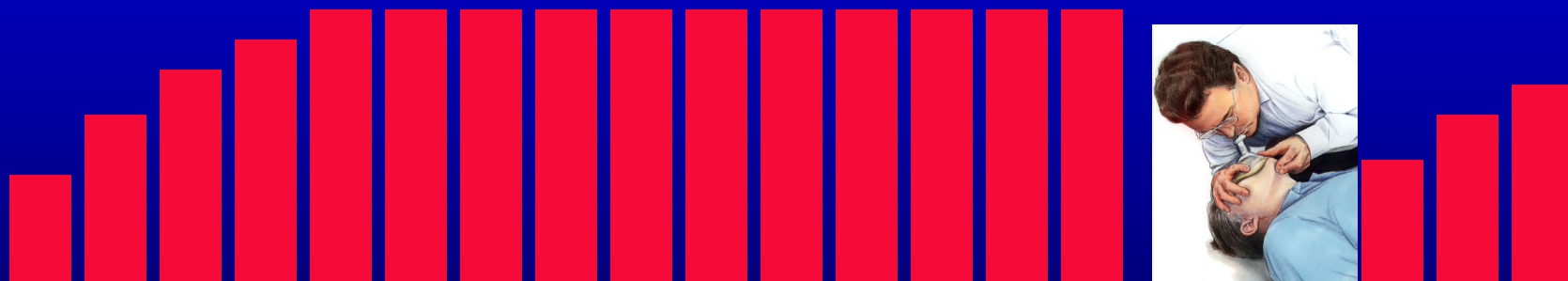
Coronary Artery Perfusion Pressure

Improves With Longer Series of Chest Compressions in Adult

Coronary Artery Pressure at 5:1 ratio



Pressure at 15:2 ratio



Adult Chest Compression Rate and Ratio: Conclusions

- **Provide chest compressions at a rate of 100/min (with pauses for 2 breaths you will actually deliver fewer than 100/min)**
- **Perform 1- and 2-rescuer CPR at a 15:2 compression-to-ventilation ratio**
- **The time for compression (push on the breastbone) should approximately equal the relaxation time**

“Compression-Only” CPR for Adult Victims

- Some rescuers are reluctant to give mouth-to-mouth breaths to strangers
- “Something” (chest compressions alone) is better than “nothing”
- In some studies of *adult* cardiac arrest for short periods, compressions only may be effective
- Compression-only is recommended for dispatcher-assisted CPR or when the rescuer is unable or unwilling to perform rescue breathing

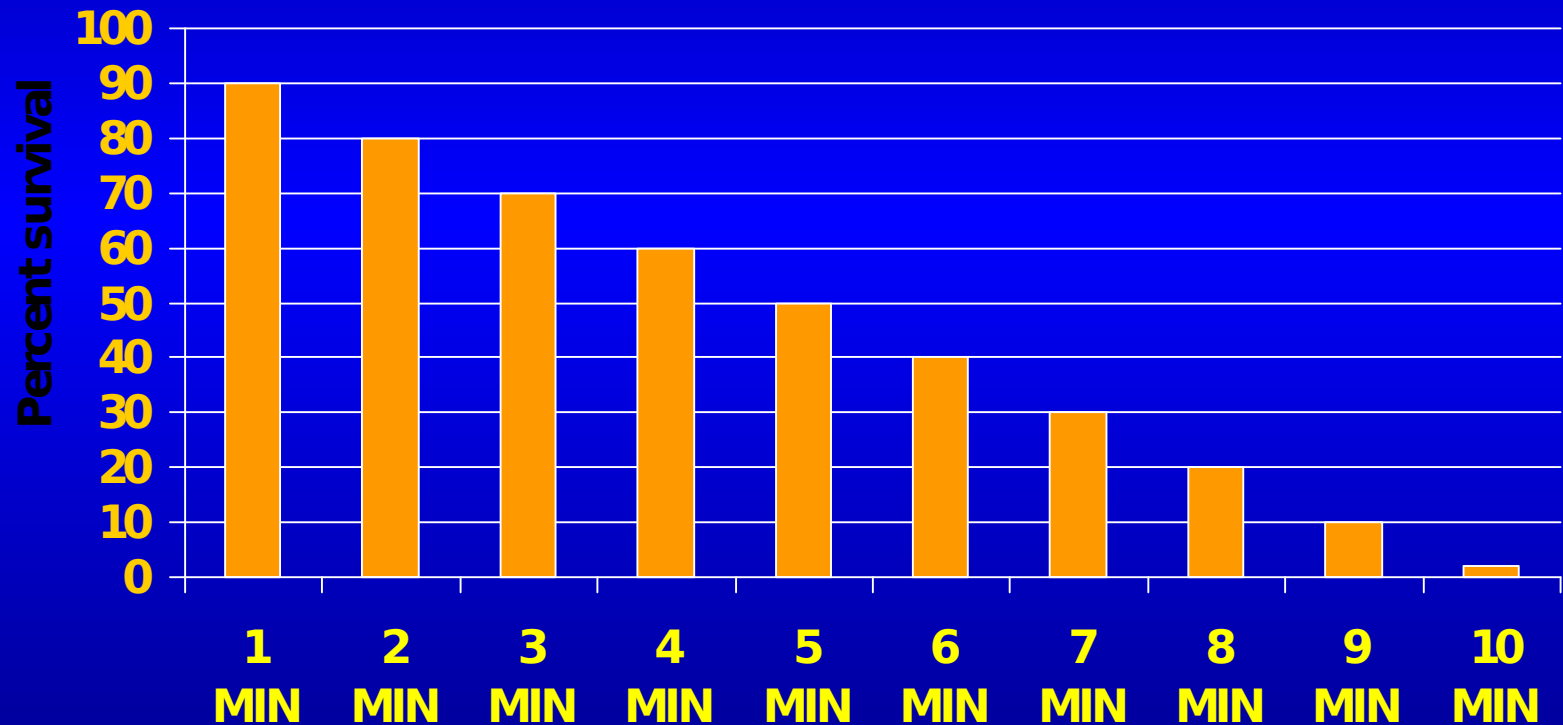
Relief of Foreign-Body Airway Obstruction in Unresponsive Victim

- **Previous guidelines included a complex set of skills to relieve foreign-body airway obstruction (FBAO) in an unresponsive victim**
- **The skills were difficult to teach, learn, and remember**
- **Inclusion of complex skills in CPR courses reduced retention of all skills**
- **The recommendations have been simplified**

Lay Rescuer Relief of FBAO in Unresponsive Adult Victim

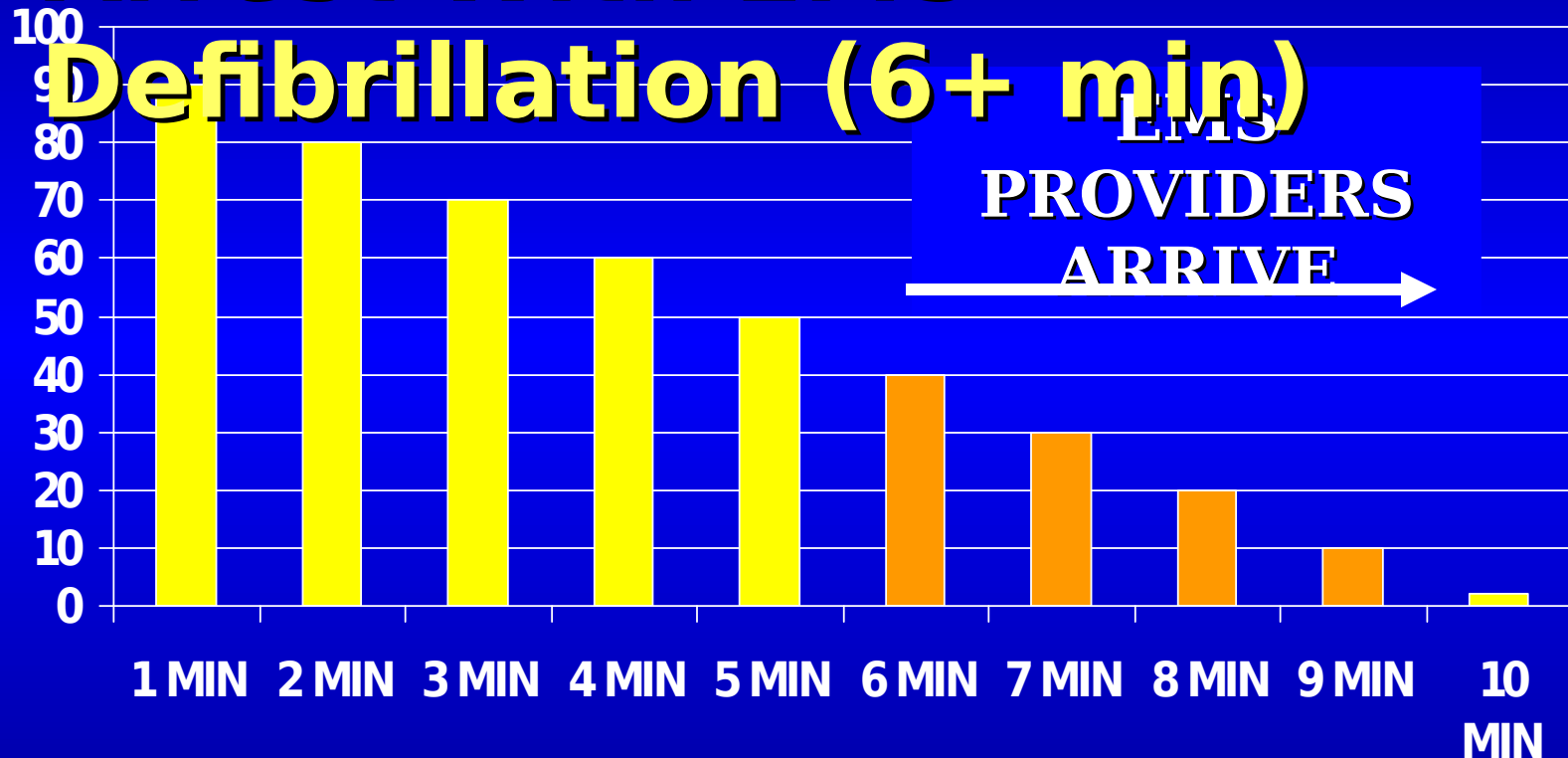
- Lay rescuer is much more likely to treat a victim unresponsive from *cardiac arrest* than a victim unresponsive from FBAO
 - Sudden cardiac arrest – 250,000 deaths/yr
 - FBAO – 3,200 deaths/yr
- Chest compressions may relieve FBAO
- If adult choking victim becomes unresponsive:
 - Contact EMS
 - Begin steps of CPR
 - Look for (and remove) obstructing object

Effect of Time to Defibrillation on Survival From Witnessed VF Arrest *Without CPR*



Cummins,
1989

Survival From VF Cardiac Arrest With EMS



Cummins,
1989

Public Access to Defibrillation (PAD)

- **Goal:** Improve survival by reducing time to defibrillation for victims of out-of-hospital cardiac arrest
- **Plan:** Develop PAD programs that place defibrillators and trained rescuers throughout the community

Keys to Successful Public Access Defibrillation

- **Programs**
 - **Automated External Defibrillators (AEDs)**
 - **Trained rescuers (CPR plus use of AED)**
 - **Medical oversight and quality assurance**
 - **Appropriate AED maintenance**
 - **Link with EMS system**

Successful Public Access Defibrillation Programs

- **Police and EMS PAD program in Rochester, MN: 49% survival**
- **Security guards in casinos in Las Vegas: 59% survival**
- **PAD program at O'Hare and Midway airports in Chicago: 75% survival**

Use of AEDs for Adult Victims of Cardiac Arrest

- **Early defibrillation (within 3 to 5 minutes) is a high priority goal in adults**
- **Use of AEDs in children ≥ 8 years of age is recommended**
- **Use of AEDs in children < 8 years is not recommended at this time**
 - **Limited experience**
 - **Accuracy of rhythm interpretation unknown**
 - **Energy levels delivered may be too high**

Conclusion: Science Behind the Adult BLS

Guidelines
• This concludes the overview of
the science behind the guidelines
for adult CPR and use of an AED

- Are there any questions?

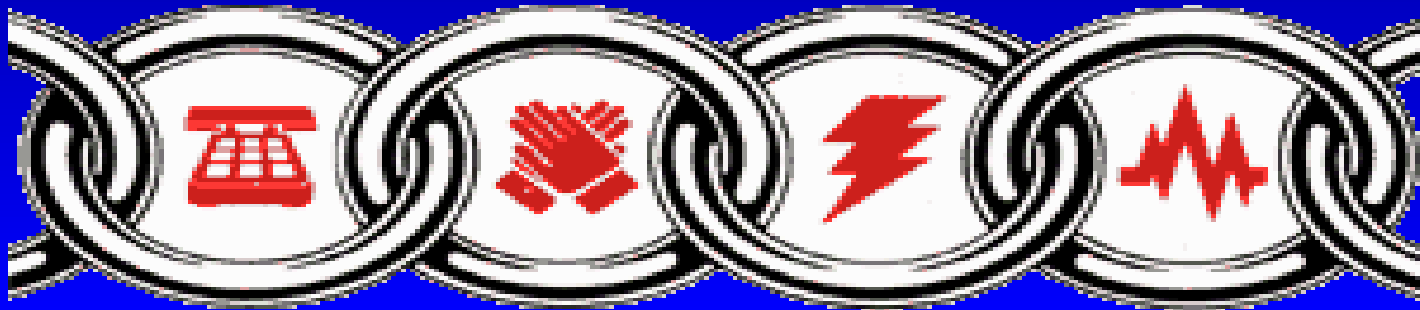


The Science Behind the BLS Guidelines

Part II: Infant and Child

AHA Chains Of Survival

ADULT



PEDIATRIC (for infants and children)

Prearrest Pediatric Emergencies

- Sudden cardiac arrest is uncommon
- Respiratory failure (breathing problems) and shock often precede cardiopulmonary arrest
- Respiratory arrest often develops *before* cardiac arrest (rescue breathing important)
- If you detect breathing problems or you are concerned the child appears ill, phone 911

The Sequence of Actions for the Lone Rescuer

- ***“Phone first”*** for unresponsive adults
- ***“Phone fast”*** for unresponsive infants and children
- **Exceptions: “Phone fast” (provide CPR first) for *all* victims of:**
 - Submersion/near drowning
 - Injury
 - Drug overdose***“Phone first”* if any infant or child with heart disease collapses suddenly**

Rescue Breathing for Infants and Children

- **Extremely important for infants and children**
- **Important to avoid rescue breathing that is too forceful or too rapid**
- **May cause gastric inflation with vomiting and aspiration**
- **Provide breaths that make the chest visibly rise**

Compression Rate and Ratio:

Infants and Children

- **Rate:** *at least* 100 times/minute for infants, about 100 times/minute for children and adults
- **Compression to breathing ratios (1 or 2 rescuers):** 5 to 1 for up to 8 years of age
- **Rationale**
 - Respiratory problems more common than cardiac problems
 - Children need faster breathing rates than adults

Pediatric Compression-Only CPR Is Not Recommended

- **Reluctance to perform mouth-to-mouth breathing has *not* been expressed by rescuers of infants and children**
- **Chest compression and rescue breathing are optimal**

Conclusion: Science Behind the Infant and

Child BLS Guidelines
• This concludes the overview of
the science behind the guidelines
for infant and child CPR

- Are there any questions?